

American Centrifuge

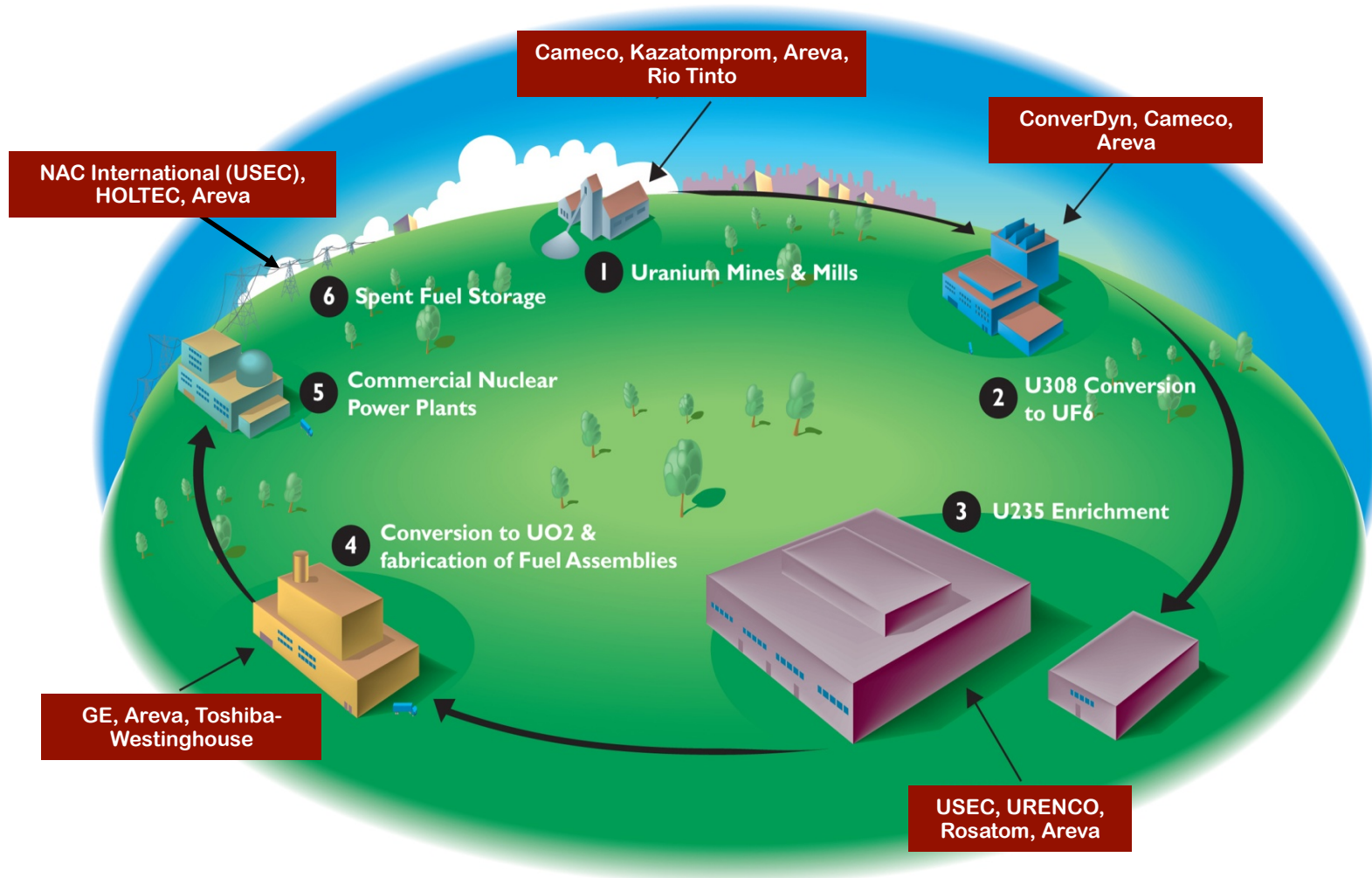
Advanced uranium enrichment technology



January 2013

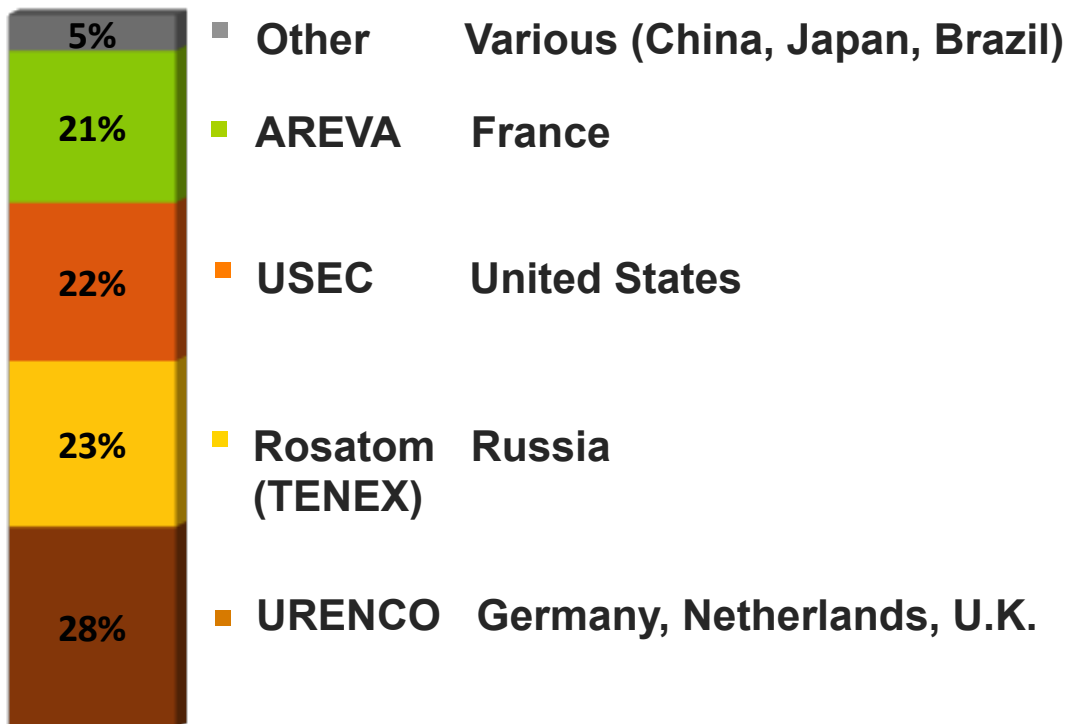


The Nuclear Fuel Cycle



Worldwide Enrichment Industry

Average Share of Worldwide Deliveries



Overall Industry

≈ 47,000,000 SWU

≈ \$7 Billion

Note:

SWU = Separative Work Unit, a standard measure of enrichment



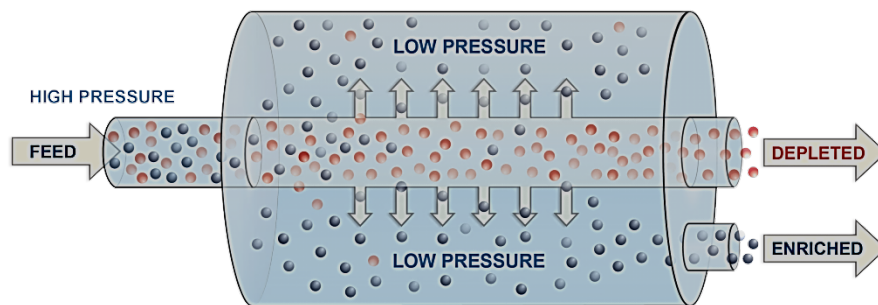
What is enrichment?

Uranium is a naturally occurring element containing U235 and U238 isotopes. Only the U235 isotope is fissionable.

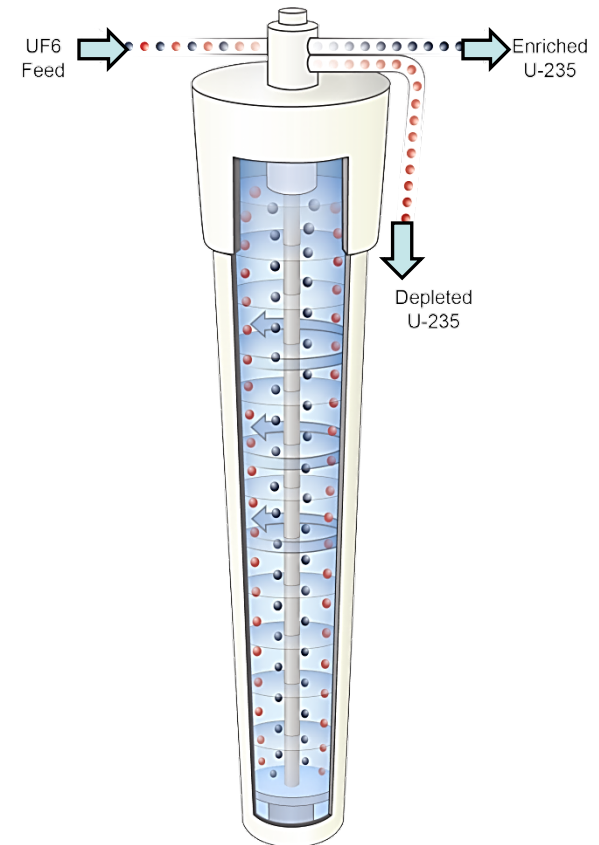
Enrichment is the process of increasing the concentration of U235 in natural uranium and decreasing the proportion of U238. Uranium hexafluoride gas (UF_6) is used in this process.

Natural uranium contains about 0.711% U235. The fuel that powers a commercial nuclear reactor needs uranium with a 4% to 5% concentration of U235.

Commercial uranium enrichment currently employs one of two technologies: **gaseous diffusion** and **gas centrifuge**.



Gaseous diffusion



Gas centrifuge

Current Enrichment Operations



The largest commercially operating uranium enrichment facility in the United States

Paducah GDP is operating at its highest efficiency and capacity in decades.

More than 5 million SWU produced in 2011.

Gaseous Diffusion Plant – Paducah, KY

Built in 1951-54 by the Atomic Energy Commission.

Gaseous diffusion production began in 1952.

Four enrichment process buildings with total floor area of 150 acres; total site area of 750 acres.

Leased from the DOE with limited USEC environmental and decommissioning liability.

USEC has extended its lease through June 2016, with renewal rights continuing thereafter.



Diffusion cell arrangement



The Next Generation in Enrichment – American Centrifuge

USEC Inc. is deploying an advanced uranium enrichment technology called American Centrifuge.

Technology originally developed by DOE during 1960s through 1980s. DOE invested over \$3 billion, and USEC has invested \$2.3 billion to date.

USEC improved the technology through modern materials, advanced computer design, digital controls and state-of-art manufacturing processes.

Current gaseous diffusion technology needs to be replaced due to an aging facility, competitive pressure from foreign-owned suppliers migrating to centrifuge production capacity, and volatile long-term energy costs at Paducah GDP.



American Centrifuge is based on the U.S. Department of Energy's original machine (pictured here), which operated as part of the Gas Centrifuge Enrichment Program at the Piketon, Ohio facility.

American Centrifuge – scale



Russian

Produce approximately
4-8 SWU per
machine per year



European

Produce approximately
40-45 SWU

*(Note: newer model may
produce 80+ SWU)*



American Centrifuge

Produce approximately
350 SWU

National Security and Nonproliferation

Tritium production. There is a current and ongoing need for replenishment of tritium to maintain the U.S. nuclear arsenal. Low Enriched Uranium used in this process must be of U.S. origin (and created by U.S. technology).

Naval propulsion. Currently, there are sufficient stockpiles of highly enriched uranium for naval reactor needs (submarines, carriers). When a future requirement arises, a domestic enrichment capacity will be needed.

Seat at the nonproliferation table. A domestic source of enrichment improves the leverage of the U.S. government in international nonproliferation initiatives.

Nonproliferation mission. A domestic enrichment source supports U.S. government technological security and classification programs and performance of export control responsibilities.



"USEC is uniquely qualified ... it is the only provider of SWU that uses U.S.-origin technology, the only current enrichment technology available to DOE that is free of peaceful use assurances. For defense and DOE programmatic purposes, DOE needs LEU that is unencumbered by peaceful use assurances and thus can be used for defense purposes."

Department of Energy, January 20, 2012

American Centrifuge – Timeline

Lead Cascade operations using prototype machines commenced on August 29, 2007.

Commenced operating Lead Cascade with approximately two dozen commercial AC100 machines in March 2010.

Nearly two years of demonstrated AC100 cascade operations and over 1,100,000 total hours of AC100 and prototype machine operations since 2007.

USEC and the Department of Energy are conducting a \$350 million cooperative research, development and demonstration (RD&D) program to confirm the technical readiness of American Centrifuge.



AC100 Lead Cascade

RD&D Program Overview

Program Scope

- Build and operate a 120-centrifuge commercial demonstration cascade.
- Accomplish five key milestones to retire project technical risk.
- Sustain the domestic U.S. centrifuge industrial base for national security purposes and potential commercialization of American Centrifuge Technology.

Cost and Schedule

- \$350 Million cost-shared (80% DOE / 20% USEC).
- 19 months: June 2012 through December 2013.

Program Outcomes

- Demonstrated capability to meet future national security needs.
- Cascade systems and centrifuge machines that will be incorporated in the commercial plant.
- Technology ready for commercial deployment.



American Centrifuge machines manufactured for the Research, Development, and Demonstration program being conducted in Piketon, Ohio.

Why American Centrifuge?



**Assembled
AC-100
machines
ready for
installation**

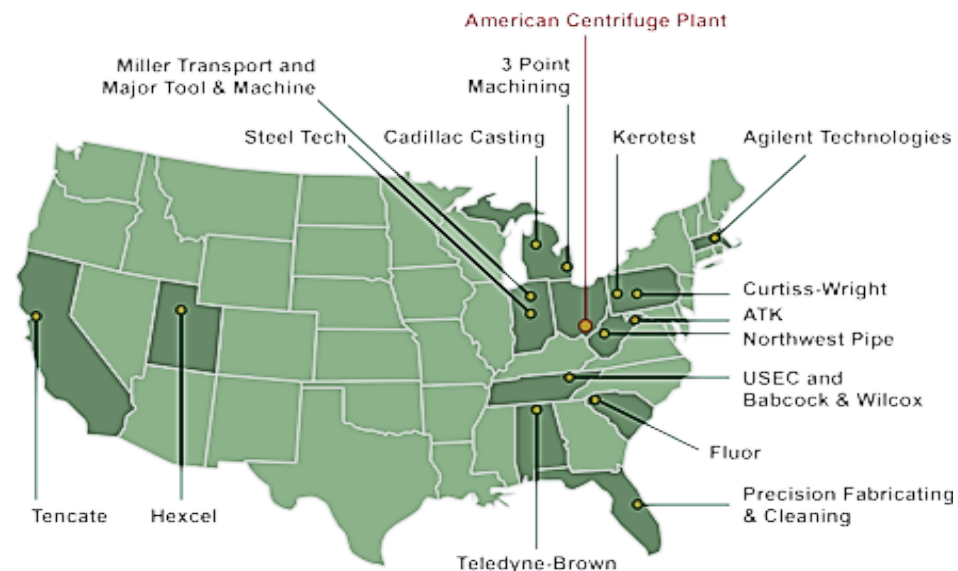
Security of supply: enhances long-term nuclear fuel supply; supports American energy security.

Manufacturing: develops an essential U.S. technology and related manufacturing capacity.

Environmental benefits : uses approximately 95% less electricity than current gaseous diffusion technology; will reduce greenhouse gases by 10,000,000 tons of emissions each year.

National security interests: supports nuclear energy nonproliferation efforts and maintenance and modernization of the nuclear arsenal.

American jobs: will create up to 8000 manufacturing jobs in a number of states, with up to 480 in Utah.



American Centrifuge Manufacturing



Advanced manufacturing equipment

Manufacturing plant: a joint venture between USEC and Babcock&Wilcox

Oak Ridge, Tennessee

The American Centrifuge Plant



Piketon, Ohio

www.AmericanCentrifuge.com



Interior of process building where centrifuges will be installed

